



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/578,390	05/05/2006	Im Young Jung	CU-4805 WWP	1845
26530 7590 11/19/2009 LADAS & PARRY LLP 224 SOUTH MICHIGAN AVENUE SUITE 1600 CHICAGO, IL 60604				
EXAMINER GIARDINO JR, MARK A				
ART UNIT		PAPER NUMBER		
2185				
MAIL DATE		DELIVERY MODE		
11/19/2009		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

**Application No.**

10/578,390

**Applicant(s)**

JUNG ET AL.

**Examiner**

MARK A. GIARDINO JR

**Art Unit**

2185

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 September 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 May 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/GS/US)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_
- Paper No(s)/Mail Date \_\_\_\_\_

### **DETAILED ACTION**

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 9/8/2009 has been entered.

The instant application having Application No. 10/578,390 has a total of 13 claims pending in the application, there are 3 independent claims and 10 dependent claims, all of which are ready for examination by the examiner.

### **INFORMATION CONCERNING DRAWINGS**

#### **Drawings**

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the limitations:

'updating the first list of objects to list those undeleted objects of the first list which remain after the lapse of the calculated residual time, and storing the updated first list in memory and wherein, if objects to be deleted remain after performing the mark phase and the first sweep phase during the communication cycle, performing only a sweep phase during subsequent communication cycles until all the objects of the first list are deleted from the memory'

must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

#### **OBJECTIONS TO THE SPECIFICATION**

The disclosure is objected to because paragraph [78] of the specification submitted 5/5/2006 describes carrier waves and data transmission through the internet as a "computer readable recording medium" and a "data storage device". However,

carrier waves and data transmission through the internet is not a "recording medium" or a "storage device". Appropriate correction is required.

**REJECTIONS NOT BASED ON PRIOR ART**

**Claim Rejections – 35 USC '101**

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claim 13 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The "computer readable medium" of claim 13 encompasses carrier waves as described in Paragraph [78] of the submitted specification. Carrier waves are not statutory subject matter. Appropriate correction is required.

**Claim Rejections - 35 USC ' 112**

**The following is a quotation of the second paragraph of 35 U.S.C. 112:**

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation "after calculating the residual time, deleting the listed objects of the first list from the memory within the calculated residual time". This makes the subsequent limitation of "if objects to be deleted remain after performing the mark phase and the first sweep phase during the communication cycle, performing only a sweep phase during subsequent communication cycles until all the objects of the first list are deleted from the memory" unclear, as the listed objects have been deleted after calculating the residual time. Thus, the conditional is never true according to the claim language. Do objects ever remain to be deleted after the first sweep phase? Is there a difference between "the listed objects" and the objects on "the first list"? Independent claims 10 and 13 have a similar issue. Appropriate correction is required.

Claim 1 recites the limitation of "performing a first sweep phase..wherein the performing of the sweep phase comprises". The limitation "the sweep phase" lacks antecedent basis, as it is unclear if "the sweep phase" refers to the "first sweep phase". Is there a difference between the first sweep phase and the sweep phase? Claims 10 and 13 have a similar issue. Appropriate correction is required.

## **REJECTIONS BASED ON PRIOR ART**

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 1-4, 6, 10, and 13 are rejected** under 35 U.S.C. 103(a) as being unpatentable over **Hasbun (US 5,640,529)** in view of **Engelstad et al (US 5,485,613)**.

**Regarding Claim 1**, Hasbun teaches a garbage data collection method performed during a communication cycle of a plurality of communication cycles of a computing device **(the communication cycle corresponding to the command and the timed command interrupt, Column 2 Lines 19-24 in Hasbun)** having memory including writeable non-volatile memory **(“solid state disk”, Column 2 Line 25 in Hasbun)**, the garbage data method comprising:

calculating a residual time up to a predetermined time limit after processing an external command **(Figure 8 in Hasbun, also Column 2 Lines 19-27)**.

However, Hasbun doesn't specifically teach performing mark and sweep phases during communication cycles or making a first list of objects to be deleted. Engelstad teaches performing a mark phase during a communication cycle, the mark phase for marking a first list of objects to be deleted from the entire writeable non-volatile memory space **(the first list corresponds to unmarked objects in the condemned region, since the objects being unmarked means they are to be deleted from memory, Column 27 Lines 9-16 in Engelstad, and the list is a list from the entire writeable non-volatile memory space, as the list is inherently from the entire writeable non-volatile memory space)**;

performing a first sweep phase during the communication cycle for deleting the listed objects of the first list from memory **(this phase corresponding to when “the object is removed from the generation and memory resources associated with the**

**object are freed”, Column 27 Lines 14-16 in Engelstad)**, wherein the performing of the sweep phase comprises:

deleting the listed objects of the first list from the memory within a predetermined time (**“the object is removed from the generation and memory resources associated with the object are freed”, Column 27 Lines 14-16, this is done within the predetermined time since this is done during garbage collection, and garbage collection must be done within a predetermined time as in Column 12 Lines 26-27)**), and

updating the first list of objects to list those undeleted objects of the first list which remain after the lapse of the calculated residual time (**the list is updated because the freed object is removed from the generation [Column 27 Lines 14-16] and thus not scanned again, so the unmarked objects in the condemned region [the first list] is updated by removing these objects from the generation**), and storing the updated first list in the memory (**the unmarked objects remain in the generation of objects to be deleted, also see Figure 4 of how after each task the garbage collector may be exited and completed later [step 412] and how freeing an object is listed as a task, Column 27 Line 22)**),

and wherein, if objects to be deleted remain after performing the mark phase and the first sweep phase during the communication cycle, performing only a sweep phase during subsequent communication cycles until all the objects of the first list are deleted from memory (**the unmarked objects remain in the generation of objects to be deleted, also see Figure 4 of how after each task the garbage collector may be**

**exited and completed later [step 412] and how freeing an object is listed as a task, Column 27 Line 22, thus the sweep phase is performed during subsequent communication cycles until it is finished and can move on to the next phase, according to the phases shown on Figure 5).**

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to which the subject matter pertains to have implemented the garbage collection of Engelstad as the method of Figure 7 in Hasbun because the method of Engelstad can complete in a predetermined period of real time, making it useful in real-time object-oriented program-controlled systems (Column 4 Lines 27-42 in Engelstad).

**Regarding Claim 2**, Engelstad and Hasbun teach all limitations of Claim 1, wherein the time limit is determined by a host that transmits the external command or the time limit is determined to be a period of time up to a time guaranteeing QoS that a user does not feel a response delay to the external command (Column 12 Line 24-25 in Engelstad, where the cycle bound is 10 ms, a small enough amount that user would not feel a response delay).

**Regarding Claim 3**, Engelstad and Hasbun teach all limitations of Claim 1, wherein the act of making the first list is performed when a garbage collection is requested (the list is made during steps 1 through 7 of Column 13 Lines 33-41, and when these commands are entered [as in the "YES" branch of step 408 of Figure 4], garbage collection is requested by the processor).

**Regarding Claim 4**, Engelstad and Hasbun teach the limitations of Claim 1 As described above, and Engelstad's garbage collection process further comprises adding to the first list any object earmarked for deletion in a prior communication cycle but remaining in the memory undeleted (phase 2 in Figure 5A of Engelstad, where older generations [objects earmarked for deletion in a prior communication cycle] are repacked into and entered into the condemned region, Column 14 Lines 17-41 in Engelstad).

**Regarding Claim 6**, Engelstad and Hasbun teach all limitations of Claim 1, wherein the act of deleting the objects of the first list comprises: making a second list of objects to be deleted from the memory during any residual time remaining after all objects in the first list (the garbage collection process will move on from step 8 in Column 13 Line 41 to step 1 in Column 13 Line 33, which is the beginning of making a second list with a new condemned region).

**Claim 10** is the apparatus analogous to the method of Claim 1, and is rejected under similar rationale.

**Claim 13** is the computer readable medium recorded thereon a computer readable program analogous to the method of Claim 1, and is rejected under similar rationale.

Claims 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hasbun and Engelstad in further view of Serlet (US 5,355,483).

**Regarding Claim 5**, Engelstad and Hasbun teach all limitations of Claim 1, but do not teach updating the list when an object is newly generated or deleted. Serlet

teaches if an object is newly generated or deleted during the command processing, updating the list of objects to be deleted (note that when garbage collection begins, the state machine described in Figure 7 of Serlet will make the list, and since the command is run as part of the garbage collection process of Engelstad, the list of objects to be deleted is updated when the command newly generates or deletes an object). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to which the subject matter pertains to have used the method of garbage collection in Figure 7 of Serlet instead of the way described by Engelstad, since using Serlet's method enables garbage collection to be "performed automatically without requiring that the ongoing processing steps of the user processor be halted during the garbage collection process" (Column 6 Lines 32-35 in Serlet).

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hasbun and Engelstad in view of Kolodner et al (US 2002/0055941).

**Regarding Claim 7**, Engelstad and Hasbun teach all limitations of Claim 1, however, the combination of references do not teach deleting an undeleted list of objects of a prior communication cycle before a command is processed.

Kolodner et al (US 2002/0055941) teaches collecting garbage before processing a command if the next command may be pressed for space (Paragraph 0138 in Kolodner). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to which the subject matter pertains to have implemented the preemptive garbage collection before processing external commands to ensure that

the external command to be processed does not have to be interrupted to perform garbage collection (Paragraph 0138 in Kolodner).

Claims 8, 9, 11, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hasbun and Engelstad in view of Wells et al (US 5,740,395).

**Regarding Claim 8**, Engelstad and Hasbun teaches all limitations of Claim 1 as discussed above. However, Engelstad and Hasbun do not teach performing together a memory write command and object delete command. Wells teaches if the command includes a memory write command or an object delete command (the command is a memory write, see Column 19 Lines 21-23 and Figures 12A and 12B in Wells), and if there is a list of objects to be deleted from the memory before the write or delete command is processed, concurrently performing the deleting of the objects and the write or delete command (Column 19 Lines 43-51 in Wells). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to which the subject matter pertains to have performed the memory write command with the object delete command since this allows the device to maintain minimum memory reserves (Column 19 Lines 43-46 in Wells). Thus, by combining the devices, the additional benefit of maintaining memory reserves necessary for proper performance is obtained.

**Regarding Claim 9**, Engelstad and Hasbun teach all limitations of Claim 1 as discussed above. However, Engelstad and Hasbun do not teach simultaneously deleting consecutively existing objects in memory, nor does he teach concurrently performing the allocating and deleting of a memory block if memory space to be

allocated for an object and memory space of objects to be deleted are consecutive memory spaces or the same memory space. Wells teaches simultaneously deleting consecutively existing objects in memory (note how blocks are cleaned up in their entirety, thus the sectors consecutively existing in memory are cleaned up simultaneously, see Column 21 Lines 50-55 in Wells). Wells also teaches allocating and deleting a memory block concurrently (Column 21 Lines 50-67 in Wells, note how the block is freed and a new block is selected, and that this new block is likely to be the block that was just freed since the criteria for choosing a block from the 5 Rules for choosing a block described by Wells have not changed substantially). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to which the subject matter pertains to have used these teachings of simultaneously deleting consecutive objects in consecutive memory space and simultaneously deleting a memory space and allocating the memory space because doing so is much faster than not performing the actions concurrently. Thus, by combining the devices, one of ordinary skill in the art would realize that the benefit of a faster device is obtained.

**Claim 11** is the apparatus analogous to the method of Claim 7, and is rejected under similar rationale.

**Claim 12** is the apparatus according to the method of Claim 8, and is rejected under similar rationale.

#### **ARGUMENTS CONCERNING NON-PRIOR ART REJECTIONS**

##### **Rejections – USC 112**

Applicant's arguments/amendments with respect to claims 1-13 have been considered, but similar issues remain in the claims. Thus, the rejection has not been removed.

### **ARGUMENTS CONCERNING PRIOR ART REJECTIONS**

#### **Rejections - USC 102/103**

Applicant's arguments that the "Free an object" task of Engelstad occurs only **once** during the "Garbage Reclamation" phase 8, and thus does not teach "if objects to be deleted remain after performing the mark phase and the first sweep phase during the communication cycle, performing only a sweep phase during subsequent communication cycles until all the objects of the first list are deleted from the memory" has been considered but is not persuasive.

The task listed in Phase 8 is to "Free an object". During this phase, the garbage collector "sequentially checks *each* object" (emphasis added, Column 27 Lines 11-13). Thus, the garbage collector must run this task multiple times during phase 8, at least once for each unmarked object. Thus, one object may be deleted during one cycle [the first sweep], and the remaining objects may be deleted during a subsequent cycle [a subsequent sweep]. Since to "Free an object" is a task, and the time is checked after every task to see if there is enough time to complete another task as shown in Figure 4, Engelstad satisfies the limitation of "if objects to be deleted remain after performing the mark phase and the first sweep phase during the communication cycle, performing only a sweep phase during subsequent communication cycles until all the objects of the first

list are deleted from the memory".

As an example to show that each task is not performed only once per phase, phase 4 lists as a task "Add an object to the LASTWILL list" (Column 23 Line 4). Even though the task is listed as adding only *an* object, two objects are added to the LASTWILL list during this phase – Object J (Column 22 Lines 31-33) and Object Q (Column 22 Lines 47-51).

As another example, in the example given by Engelstad, objects on the SAVEDLIST are processed at two distinct times – once after a scan of generation N+2 (Column 22 Lines 38-39) and once after a scan of generation N+3 (Column 22 Line 52). The task is listed as "Process objects on the SAVEDLIST" (Column 23 Line 5), but this task is run twice.

Therefore, the tasks are a list of tasks performed during each specific phase, and are not necessarily run only once per cycle.

Applicant's arguments on Page 9 of the submitted remarks that "Engelstad performs garbage collection according to a cycle steal interval N" and that "a pre-selected number of objects are to be allocated during the phase", which is contrary to the present invention because the present invention does not teach a decay rate calculation has been considered but is not persuasive. Just as applicant's sweep phase contains "calculating a residual time", and "updating the first list of objects", Engelstad's sweep phase contains operations other than solely freeing objects. Thus, Engelstad teaches the limitation of "performing only a sweep phase during subsequent

communication cycles".

Applicant's argument that Engelstad does not teach scanning the "entire writeable non-volatile memory space" has been considered but is not persuasive. The exact language in claim 1 is "a first list of objects to be deleted from the entire writeable non-volatile memory space", and the unmarked objects of the condemned region [Engelstad's list] are inherently "from the entire writeable non-volatile memory space", and thus Engelstad satisfies this limitation of the claim.

#### **CLOSING COMMENTS**

##### **Conclusion**

#### **STATUS OF CLAIMS IN THE APPLICATION**

The following is a summary of the treatment and status of all claims in the application as recommended by **M.P.E.P. ' 707.07(i)**:

#### **CLAIMS REJECTED IN THE APPLICATION**

Per the instant office action, claims 1-13 have received a first action on the merits and are subject of a first action non-final.

#### **DIRECTION OF FUTURE CORRESPONDENCES**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to M. Anthony Giardino whose telephone number is (571)

270-3565 and can normally be reached on Monday - Thursday 7:30am – 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Sanjiv Shah can be reached on (571) 272-4098. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

M.A. Giardino

/Stephen Elmore/  
Primary Examiner, Art Unit 2185

/M.G./

Patent Examiner  
Art Unit 2185

November 19, 2009